



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2011

MATHEMATICS P1

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages and a 2 page diagram sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 8 questions. Answer ALL the questions.
2. Clearly show ALL calculations, diagrams, graphs, etc that you have used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical may be used), unless stated otherwise.
4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Diagrams are NOT drawn to scale.
7. Write legibly and present your work neatly.
8. An information sheet with formulae is attached.
9. A diagram sheet are supplied for QUESTIONS 7.2.2; 7.2.3 and 8.2.2. Write your name in the space provided and then hand the diagram sheet in with your ANSWER SHEET.

QUESTION 11.1 Solve for x ,

1.1.1 $2x^2 + 2x = 0$ (3)

1.1.2 $x + 2 = \frac{6}{x}$ (5)

1.1.3 $27^{\frac{2}{3}} \cdot 81^{-\frac{1}{2}} = 9^x$ (4)

1.1.4 $\frac{10}{x-3} \geq 5$ (6)

1.2 Given: $\frac{a^2 - a^{-2}}{a - a^{-1}}$ 1.2.1 For what values of a is the expression not defined? (3)1.2.2 Assume that a does not have these values, then simplify this expression. (4)1.3 Solve for x and y in the following simultaneous equations:

$$y - 2x + 1 = 0 \text{ and } xy = 2y + x^2 + 3x - 10$$
 (7)
[32]

QUESTION 2Given: $y = -\frac{1}{2}x^2 + 2x + 4\frac{1}{4}$ 2.1 Write the function in the form: $y = a(x - p)^2 + q$. (4)

2.2 Does the function have a minimum or maximum value? Explain. (2)

2.3 Find the minimum or maximum value in QUESTION 2.2. (1)

2.4 Hence calculate the maximum or minimum value of:

$$\sqrt{-\frac{1}{2}x^2 + 2x + 4\frac{1}{4}}$$
 (2)

2.5 Determine the x -intercepts and y -intercepts of the function. (6)
[15]

QUESTION 3

- 3.1 $T_n = 3 \cdot 2^{n-1}$
- 3.1.1 Write down the first four terms of the sequence. (2)
- 3.1.2 Which pattern do you notice? (1)
- 3.1.3 What will the sum of the first four terms be? (1)
- 3.1.4 Which term of the above sequence will be equal to 6144? (5)
- 3.2 The number pattern 8; 20; 38; 62 ... is such that the sequence of 'second difference' is a constant.
- 3.2.1 Write down the fifth term of the number pattern. (1)
- 3.2.2 Determine an algebraic expression that represents the n^{th} term of the number pattern. (7)
- 3.2.3 Calculate the 20^{th} term of the number pattern. (1)
- [18]**

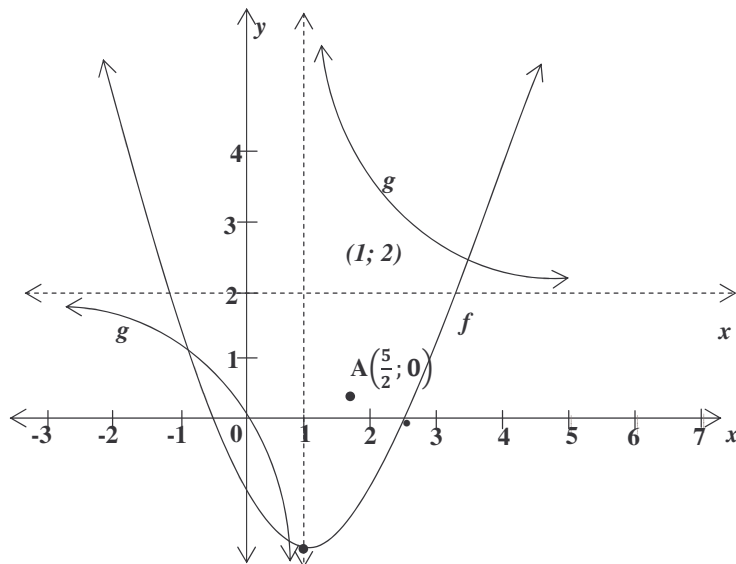
QUESTION 4

- 4.1 The purchase price of a motorcar is R185 000. The value of the motorcar depreciates at a rate of 20% p.a. Calculate the value in 4 years time on:
- 4.1.1 a straight line basis, (2)
- 4.1.2 a reducing balance basis. (2)
- 4.2 Convert a nominal interest rate of 8,4% p.a. compounded monthly to an effective annual interest rate. (4)
- 4.3 Mr Gozo decided to sell his car through an agent. The agent agrees to sell the car, but says he will drop the price of the car every month that it is not sold by using a reducing balance rate of 18% per annum, compounded monthly. They agree on an initial selling price of R39 999.
- 4.3.1 Calculate the price the agent will advertise Mr Gozo's car for after three months. (2)
- 4.3.2 If the car is sold after 5 months, calculate the amount of money Mr Gozo has lost from the original selling price. (3)
- 4.4 Sipho invested x rand in the bank for 10 years earning interest at a rate of 9,6% p.a. compounded monthly for the first 4 years and 6,89% p.a. compounded quarterly for the remaining 6 years. How much did Sipho invest if he received R28 470 at the end of 10 years? (6)
- [19]**

QUESTION 5

Sketched below are the graphs of $f(x) = (x - p)^2 + q$ and $g(x) = \frac{a}{x-b} + c$.

$A(2\frac{1}{2}; 0)$ is a point on the graph of f . The asymptotes of g intersect at the point $(1; 2)$.

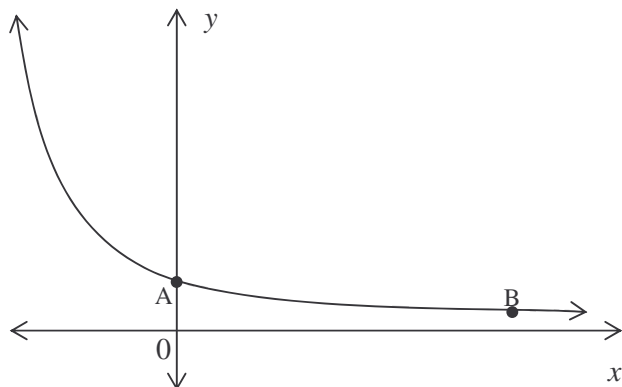


- 5.1 Determine the equation of g . (5)
- 5.2 Determine the coordinates of P, the turning point of f . (4)
- 5.3 Write down the equations of the asymptotes of $g(x - 1)$. (2)
- 5.4 Write down the equation of h , if h is the image of f in the x-axis. (1)

[12]

QUESTION 6

The accompanying diagram shows the graph of $y = a^x$.

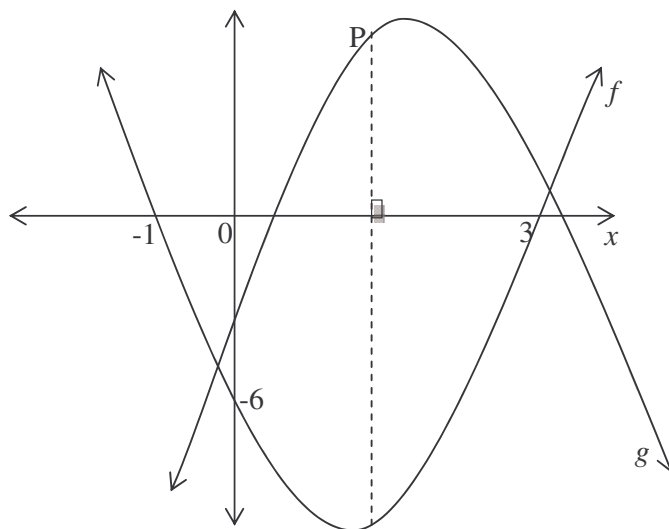


- 6.1 State the coordinates of A. Explain. (2)
- 6.2 How can we tell that $0 < a < 1$? (1)
- 6.3 Determine a if B is the point $\left(4; \frac{1}{16}\right)$. (3)
- 6.4 Determine the equation of the graph obtained if the graph alongside is reflected about the y-axis. (2)
- 6.5 Write down the coordinates of the point of intersection of the two graphs. (2)
- 6.6 Give the domain and the range of the function. (2)

[12]

QUESTION 7

- 7.1 The diagram shows the graphs of $f(x) = ax^2 + bx + c$ and $g(x) = -x^2 + 5x - 1$. The graph of f intersects the x-axis at $(-1 ; 0)$ and $(3 ; 0)$ and the y-axis at $(0 ; -6)$.



- 7.1.1 Find the values of **a**, **b** and **c**. (5)
- 7.1.2 P and Q are two points on g and f respectively, such that $g(x) > f(x)$ and PQ is perpendicular to the x-axis. Find the maximum length of PQ. (6)
- 7.2 7.2.1 If $y = mx - 6$ is the equation of a straight line intersecting the x-axis at 3, determine the value of m . (2)
- 7.2.2 Draw a sketch graph of $y = x^2 - 3x - 4$. Show all intercepts with the axes and the coordinates of the turning point. (6)
- 7.2.3 On the same set of axes as in QUESTION 7.2.1 draw the graph of the straight line in QUESTION 7.2.2. (2)

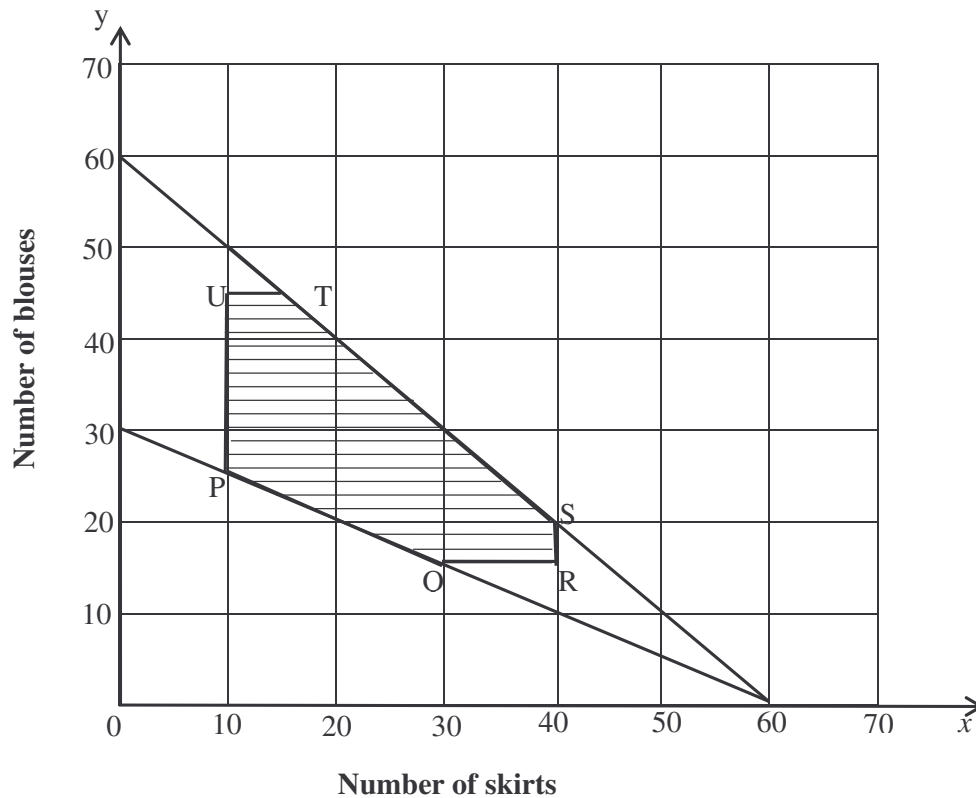
[21]

QUESTION 8

A young entrepreneur sells skirts and blouses at a flea market. Suppose x skirts and y blouses are sold every week, and that the following constraint inequalities are applicable:

$$10 \leq x \leq 40; \quad 15 \leq y \leq 45; \quad x + y \leq 60; \quad 2y + x \geq 60$$

In the diagram a graphical representation, with feasible region shaded, is given



8.1 Determine the coordinates of points P, Q, S and T. (8)

8.2 The entrepreneur makes a profit of R3,00 per skirt and R5,00 per blouse.

8.2.1 Write down an equation that will represent the profit for the week. (2)

8.2.2 How many of each type of clothing should be sold every week to make a maximum profit? Draw the search line on the graph, by indicating it as a dotted line in its optimum position. (3)

8.2.3 Determine how many of each type of clothing should be sold every week so that the smallest profit can be made. Calculate the smallest profit that can be made. (5)

8.3 Suppose that an increase in the price of the material for making skirts leads to the fact that no profit can be made on skirts.

How many of each type of clothing should then be sold per week to make a maximum profit?

(3)
[21]

INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^n (a + (i-1)d) = \frac{n}{2} (2a + (n-1)d)$$

$$\sum_{i=1}^n ar^{i-1} = \frac{a(r^n - 1)}{r - 1} ; \quad r \neq 1$$

$$\sum_{i=1}^{\infty} ar^{i-1} = \frac{a}{1-r} ; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1+i)^{-n}]}{i} \quad f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta \quad (x - a)^2 + (y - b)^2 = r^2$$

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2 \sin^2 \alpha \\ 2 \cos^2 \alpha - 1 \end{cases}$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n} \quad \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \quad (A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

DIAGRAM SHEET

NAME:	
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QUESTION 7

7.2.2/7.2.3

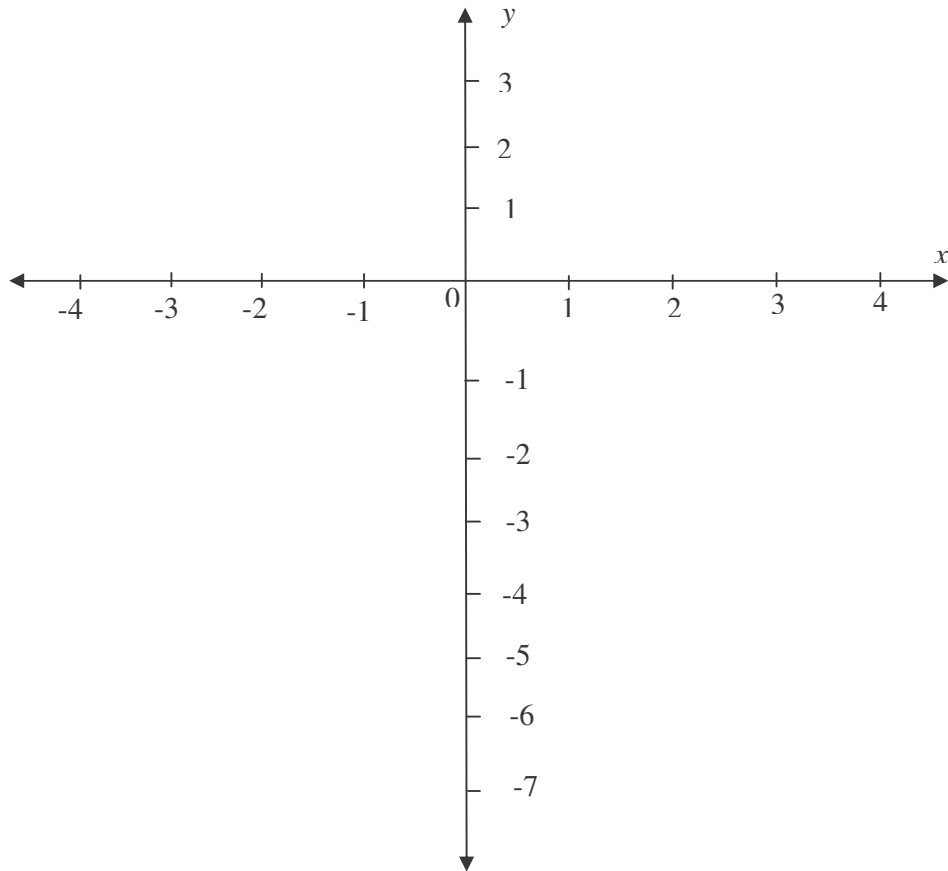


DIAGRAM SHEET

NAME:

8.2.2

